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14. ABSTRACT We found that CWS can do a reasonable job of capturing expertise in arithmetic compared to indices that incorporate correct answers. We also found (in conjunction with Rick Thomas and Alex Kirlik) similar results for a performance domain, putting a golf ball. In addition, we initiated the development of designs that allow the extraction of individual performance from team scores. We used the CTEAM simulation to study the development of expertise of teams of simulated air traffic controllers. CWS served as the primary index of performance, although traditional measures were examined as well. As a performance measure, CWS (based on time through sector) was observed to be more sensitive to improvement over practice than operational errors. Experts make too few errors to provide differential accuracy information, while CWS attends to aspects of performance that can always be observed, whether errors are made or not.					
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AFRL-SR-AR-TR-07-0233

## **Final Report**

“Performance Evaluation of Expert Team Members”

Submitted to Jerome Busemeyer, Program Manager

AFOSR Grant #FA9550-04-1-0230

4/1/2004- 3/31/2007

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**Objectives:** Our goal was to explore the utility of the CWS index of performance, and to apply that index to team performance.

**Key Findings:** We found that CWS can do a reasonable job of capturing expertise in arithmetic compared to indices that incorporate correct answers. We also found (in conjunction with Rick Thomas and Alex Kirlik) similar results for a performance domain, putting a golf ball. In addition, we initiated the development of designs that allow the extraction of individual performance from team scores.

We used the CTEAM simulation to study the development of expertise of teams of simulated air traffic controllers. CWS served as the primary index of performance, although traditional measures were examined as well. As a performance measure, CWS (based on time through sector) was observed to be more sensitive to improvement over practice than operational errors. Experts make too few errors to provide differential accuracy information, while CWS attends to aspects of performance that can always be observed, whether errors are made or not.

At the individual level, initial (untrained) skill superiority was maintained over trials. Moreover, training yielded skill superiority that was not overcome with practice. Thus, with individuals, rank orders of performance were maintained whether initial superiority was produced by individual differences or by training.

A similar picture emerged for team training. That is, initially superior teams maintained their advantage over trials. Although, inferior teams generally improved with practice, they did not catch up to the superior teams. As with individuals, final rankings were highly correlated with initial rankings.

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#### **Publications:**

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- Crow, J., Shanteau, J., & Casey, J. D. (2004). Using the internet to investigate consumer choice spaces. *Behavior Research Methods, Instruments, & Computers*, 35, 259-262.
- Pingenot, A. M., Shanteau, J., & Pingenot, J. D. F. (in press). Quantitative method of medication system interface evaluation. *Computers, Informatics, Nursing*.
- Pingenot, A. M., Shanteau, J., & Senstacke, D. N. (in press). Examination of communication requirements of inpatient medication management using cognitive work analysis. *Journal of the American Medical Informatics Association*.



- Shanteau, J. (2004). Agricultural psychology. In W. E. Craighead & C. B. Nemeroff (Eds.), *Condensed encyclopedia of psychology and neuroscience*. NY: John Wiley & Sons.
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- Weiss, J. W., & Weiss, D. J. (Eds.) (in press). *The essential Ward Edwards*. New York: Oxford University Press.
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### **Presentations:**

- Brennan, K., & Weiss, D. J. *Gold, silver, and Bayes metal standards*. Paper presented at the Bayesian Research Conference, Fullerton, CA, January 2006.
- Harries, P., Gilhooly, K., Weiss, D. J., Tomlinson, C., & Harries, C. Training decision making in novices: A website to develop skills in referral prioritization. Paper presented at the Society for Medical Decision Making Europe 2006, Birmingham, GB, June 2006.
- Shanteau, J. *Why dynamic decision making is important for understanding expertise*. Keynote presentation at Risk, Decision and Human Error Conference, Rovereto, Italy. January 2004.
- Shanteau, J., Friel, B., Thomas, R., & Raacke, J. *Assessing training in an air traffic control microworld*. Paper presented at the International Meeting of the Brunswik Society, Minneapolis, November 2004.
- Shanteau, J., & Raacke, J. *Assessing the development of decision-making expertise in teams*. Paper presented at the Psychonomic Society meeting, Minneapolis, November 2004.
- Shanteau, J., Raacke, J., & Weiss, D. *Evaluation of teams in an air-traffic-control microworld*. Paper presented at HCI-Aero Conference, Toulouse, France, September 2004.
- Shanteau, J., Raacke, J., Weiss, D. J., Friel, B., & Thomas, R. *Evaluation of expert team performance*. Colloquium presented at School of Social Science (Business), University of Toulouse, France, October 2004.
- Shanteau, J. *Portraits of five pioneers of JDM: In their own words*. Special invited presentation at the Society for Judgment and Decision Making meeting, Minneapolis, November 2004.
- Shanteau, J., Friel, B. F., Thomas, R. P., & Raacke, J. D. *Assessing training in an air traffic control microworld*. Paper presented at the Bayesian Research Conference, Fullerton, CA, January 2005.
- Shanteau, J., Friel, B. F., Thomas, R. P., & Raacke, J. D. *Skill development in air traffic control*. Colloquium presented at Department of Psychology, Wichita State University, KS, March 2005.
- Shanteau, J. *Improving Decision Making of Experts: Four Successes and A Failure (4 Weddings & A Funeral?)*. Paper presented at the Oklahoma-Kansas Decision Making Conference, Oklahoma City. May 2005.
- Shanteau, J. Raacke, J., & Friel, B. *Improving decision making of experts: Four successes and one failure*. Keynote Presentation at Human Ergonomics Conference, University of Toulouse, France. October 2005.



- Shanteau, J. *Friendly vs unfriendly environments: The impact on decision making models*. Colloquium presented at School of Social Science (Business), University of Toulouse, France. October 2005.
- Harries, P., Gilhooly, K., Weiss, D. J., Tomlinson, C., & Harries, C. *Training decision making in novices: A website to develop skills in referral prioritization*. Paper presented at the Society for Medical Decision Making Europe 2006, Birmingham, England, June 2006.
- Shanteau, J. *Overconfidence vs. self-confidence in experts*. Paper presented at the International Meeting of the Brunswik Society, Toronto, November 2005.
- Shanteau, J. *The design of everyday decisions*. Paper presented at the Oklahoma-Kansas Decision Making Conference, Oklahoma City, April 2006.
- Shanteau, J. *Improving decision making: Four successes and a failure*. Keynote presentation at Stirling Symposium on Decision Making Research, University of Stirling, Scotland, May 2006.
- Shanteau, J. *Psychological perspectives on organ donation: The reason for the shortage*. Colloquium presented at the Department of Nursing and Midwifery, University of Stirling, Scotland, May, 2006.
- Shanteau, J. *The design of everyday decision making*. Informal presentation at the University of Stirling, Scotland, May 2006.
- Shanteau, J., Weiss, D. J., Raacke, J., & Barlett, C. *Performance evaluation of skill development in air traffic control teams*. Invited presentation at the Air Force Office of Scientific Research Cognitive/Decision Making Program Review Workshop, Fairborn, OH, April 2006.
- Shanteau, J., Weiss, D. J., Raacke, J., Friel, B., Vowels, C., & Barlett, C. *Performance assessment of team training in an air traffic control environment*. Paper presented at International Aviation Training Symposium (IATS). Oklahoma City, July, 2006.
- Weiss, D. J. *There really are "I"s in team*. Paper presented at the Oklahoma-Kansas Decision Making Conference, Oklahoma City, May 2005.
- Weiss, D. J. *Introduction to a symposium: The final collaborations of Ward Edwards*. Symposium organized at the Bi-annual Conference on Subjective Probability, Utility, and Decision Making, Stockholm, August 2005.
- Weiss, D. J. *Individual performance and team functioning*. Paper presented at the International Meeting of the Brunswik Society, Toronto, November 2005.
- Weiss, D. J. *How to study expertise*. Invited presentation at the California State University Regional Human Factors Conference, Long Beach, CA, February 2006.
- Weiss, D. J. *Individual performance and team functioning*. Paper presented at the International Congress of Applied Psychology, Athens, Greece, July 2006.
- Weiss, D. J. *Evaluating people who evaluate people*. Colloquium presented to the Department of Psychology, Carleton University, Canada, January 2007.
- Weiss, D. J., & Brennan, K. *CWS assessment of expertise when an external standard is available*. Paper presented at the Oklahoma-Kansas Decision Making Conference, Oklahoma City, April 2006.

- Weiss, D. J., Edwards, W., & Weiss, J. W. (January, 2005). *When is the bird in the hand worth more?* Paper presented at the Bayesian Research Conference, Fullerton, CA, January 2005.
- Weiss, D. J., Edwards, W., & Weiss, J. W. *Bird in the hand*. Paper presented at the Bi-annual Conference on Subjective Probability, Utility, and Decision Making, Stockholm, August 2005.
- Weiss, D. J., & Shanteau, J. *Evaluating people who evaluate people*. Paper presented at the International Congress of Psychology, Beijing, August 2004.
- Weiss, D. J., Shanteau, J., & Harries, P. *Objective analysis of professional opinion*. Paper presented at the International Meeting of the Brunswik Society, Minneapolis, November 2004.
- Weiss, D. J., Thomas, R., Miller, S., & Kirlik, A. Measuring performance without (and with) an external standard. Paper presented at the International Meeting of the Brunswik Society, Houston, November 2006.
- Weiss, D. J., Thomas, R., Miller, S., & Kirlik, A. How to improve your golf score. Paper presented at the Edwards Bayesian Research Conference, Fullerton, CA, January 2007.
- Weiss, D. J., Weiss, J. W., & Edwards, W. *Bird in the hand decisions*. Poster presented at the Judgment/Decision Making Conference, Toronto, November 2005.
- Weiss, J. W., Weiss, D. J., & Edwards, W. *Clinical significance: A critical decision for evidence-based practice*. Poster presented at the Judgment/Decision Making Conference, Minneapolis, November 2004.
- Weiss, J. W., Weiss, D. J., & Edwards, W. *Clinical significance decisions*. Poster presented at the Judgment/Decision Making Conference, Toronto, November 2005.
- Weiss, J. W., Weiss, D. J., & Edwards, W. *Big decisions, little decisions: The hierarchy of everyday life*. Poster presented at the Judgment/Decision Making Conference, Toronto, November 2005.
- Weiss, J. W., Weiss, D. J., & Edwards, W. *Sex, drugs, and gluttony: Everyday options*. Paper presented at the Bayesian Research Conference, Fullerton, CA, January 2006.

**New discoveries, inventions, or patent disclosures:** None.

**Honors/Awards:** Shanteau was named as *University Distinguished Professor* at Kansas State University in April 2005.